The Art and Science of Flight Instruction

(or how I learned to transfer knowledge in the cockpit)

Captain Dave Price, USN
Commander, Training Air Wing FOUR

Education vs. Training
effect
Learning Theory
Art and Science
Decision-making
Evaluating vs. Instructing
methodology
Overload!
Behavior
Physical Skills
Humans!
Managing Risk
techniques
Knowledg
Teaching vs. Learning
NATOPS
Perception
Bloom's Taxonomy

Discussion Themes

- What is learning?
  - *Taxonomy of Learning Domains*
- What is Teaching?
  - *Teaching Concepts.*
  - *Teaching Situational Awareness*
  - *Teaching Monkey Skills*
  - *Teaching Decision-making*
- Mentoring
  - *Roles and responsibilities*
  - *Mentoring New Instructors*

What is Learning?

- Three basic domains:
  - ***Cognitive****: mental skills (*Knowledge*)*
  - ***Affective****: growth in feelings or emotional areas (*Attitude*)*
  - ***Psychomotor****: manual or physical skills (*Skills*)*
- Which are flight instructors involved with?
- Bloom's Taxonomy
  - *A tool for professional educators*

Affective Domain

- **Receiving:** *The lowest level. The student passively pays attention. Without this level no learning can occur.*
- **Responding:** *The student actively participates in the learning process, not only attends to a stimulus; the student also reacts in some way.*
- **Valuing:** *The student attaches a value to an object, phenomenon, or piece of information.*
- **Organizing:** *The student can put together different values, information, and ideas and accommodate them within his/her own schema; comparing, relating and elaborating on what has been learned.*
- **Characterizing:** *The student holds a particular value or belief that now exerts influence on his/her behaviour so that it becomes a characteristic.*

Cognitive Domain

- **Knowledge:** *Exhibit memory of previously-learned materials by recalling facts, terms, basic concepts and answers*
- **Comprehension:** *Demonstrative understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas*
- **Application:** *Using new knowledge. Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way*
- **Analysis:** *Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations*
- **Synthesis:** *Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions*
- **Evaluation:** *Present and defend opinions by making judgments about information, validity of ideas or quality of work based on a set of criteria*

Psychomotor Domain

- **Perception:** The ability to use sensory cues to guide motor activity. This ranges from sensory stimulation, through cue selection, to translation.
- **Set**: Readiness to act. Includes mental, physical, and emotional sets. Predetermine a person's response to different situations (sometimes called mindsets).
- **Guided Response**: The early stages in learning a complex skill that includes imitation and trial and error. Adequacy of performance is achieved by practicing.
- **Mechanism**: The intermediate stage in learning a complex skill. Learned responses have become habitual and movements can be performed with some confidence and proficiency.
- **Complex Overt Response**: Skillful performance of motor acts that involve complex movement patterns. Proficiency is indicated by a quick, accurate, and highly coordinated performance, requiring a minimum of energy. This category includes performing without hesitation, and automatic performance.
- **Adaptation**: Skills are well developed and can be modified to fit special requirements.

What is Teaching?

- Preparation?
- Defining Objectives?
- Communication?
- Presentation?
  - *Demonstration*
  - *Introduction*
  - *Practice*

Teaching Concepts

- Sequence information
  - *Chronological (step fashion)*
  - *Elemental (component parts build to the whole*
- Link to existing knowledge (Socratic)
  - *Analogies and metaphors*
- Explain importance
  - *Answer the "why"*
- Have student "teach" it back to you or others

Teaching Situational Awareness

- What is “headwork/SA?”
  - *Perception and interpretation of information?*
- When will information overload likely occur?
- What/where is the critical information?
- How do we organize and manage information?
- Exercise information processing skills.
- How to “get ahead of the plane.”
  - *What’s next?*
- Crew Resource Management
- Technology Management
- Ever heard of Boyd’s OODA Loop?

Teaching “Monkey Skills”

- “Walk” through the maneuver, task, procedure.
  - *Use more time and space to slow the pace*
- “Chunk” the task. Practice elements before combining.
  - *You do it all*
  - *You do some elements, stud does some elements*
  - *Stud does it all*
- Mentored Practice
  - *Muscle memory*
  - *Habit patterns*

Teaching Decision-making

- Scenarios
  - *"What ifs" during flight planning*
  - *Walk through how a situation unfolds*
- Situational analysis
  - *How do you recognize a "situation?"*
  - *Options and outcomes. Advantages and disadvantages.*
  - *Recognizing trends (positive and negative)*
  - *Thinking geometrically (visualizing future branches)*
- Recognizing effects of decisions and actions
- Communication and collaboration
- Practice
  - *Let students make mistakes*

The Brief

- What is the purpose of the brief?
  - *Teaching?*
  - *Assessment of learning?*
  - *Communication of objectives?*
  - *Feedback on progress?*
- Organization
- Mission Planning
- Presentation

Missed Opportunities in Briefs

- Evaluation and teaching imbalance
- Unrealistic instructor expectations
- Not learning together
- Poor use of presentation resources
  - *White boards, model planes*
- Instructor-centric vs. student-centric
- Imparting confidence

Common Instructor Errors

- Not letting students make mistakes
- Too many talkies.
  - *One tool: "I'm not going to talk unless you scare me."*
- Not focusing on elemental errors.
  - *Remember chunking? Think of an example.*
- Loss of the learning environment
  - *Yelling represents fear and/or incompetence*
- Allowing the student to get behind for the "gotcha," resulting in adversarial atmosphere
  - *Or worse, instructor gets behind too!*

Mentoring

- At its most basic level, mentoring is a process in which an individual with more experience or expertise provides encouragement, advice, and support to a less experienced colleague, with the goal of helping the person being mentored learn something that he or she would have learned more slowly, less effectively, or not at all if left alone (*Managers as Mentors* by Chip Bell).

- As defined by Margo Murray in *Beyond the Myths and Magic of Mentoring*, mentoring is:

  The Deliberate pairing of a more skilled or experienced person with a lesser skilled or experienced one, with the agreed-upon goal of having the lesser skilled person grow and develop specific competencies.

Mentor Roles and Responsibilities

- Instructor skills and experience
  - *Relevant and professional*
- Personality
  - *Does the student regret time spent together?*
- Communication
  - *Transmission and reception!*
- Aviator *and* Officer role model
  - *Do your students want to be like you?*
- Goals and expectations
  - *Shared and realistic?*
- Feedback on progress
  - *Timely and constructive?*

Mentoring New Instructors

- Is this one of the roles of the Stan IP?
- Mentoring peers
- Ground and flight training observation
- Standardization Flights
- Professional tone in the ready room
- Your example of mentorship

Final Thoughts

- Be the expert…but also be human.
- Be in charge….but lead and mentor.
- Facilitate your students' learning.
- Make your students proud of you.
- Pursue the profession of instructing.
- Instill your love of flying in them.
- Have fun!